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Umphrey, Stewart. *Natural Kinds and Genesis: The Classification of Material Entities*. Lanham, MD: Lexington Books, 2016. 186 pages. \$80.00 (cloth). ISBN 978–1–498–53141–2.

Stewart Umphrey opens his book, *Natural Kinds and Genesis: The Classification of Material Entities*, with a description of Jorge Luis Borges' account of a possibly fictional ancient Chinese encyclopedia entry that presents a humorous, yet troubling, taxonomy of animals.

[...] animals are divided into the following kinds: those belonging to the Emperor, embalmed ones, those which have been trained, suckling pigs, mermaids, fabulous ones, stray dogs, those included in this classification, those trembling as if they were mad, innumerable ones, those drawn with a fine camel's hair brush, others, those having just broken a flower vase, and those resembling flies from a distance.

(1)

The absurdity of this classification seems self-evident to us. It is hard to take such a list seriously; indeed, it is hard *not* to think that the list was only intended in jest. The list provokes laughter, in part, because it shows what happens when “taxonomy goes on a holiday” (1). But the list also might provoke a deeper worry, hidden behind our laughter—a deep angst about our other potential classificatory schemata. Might it be the case that *all* such classifications of so-called natural things are arbitrary and based on nothing but mere convention? Could it finally be true that all attempts to carve up the natural world into categories will make cuts that are so constrained by the assumptions, biases, and prejudices of the ones wielding the knife that they will fail to capture anything we might call nature itself? The question presses upon us not only as a metaphysical and epistemological conundrum, raised by a Borges-inspired thought experiment. It emerges for us in our politics and ethics, whenever we draw boundaries between individuals and groups. It is thus of the utmost importance to ask the three fundamental questions that guide Umphrey's book: (1) What is a natural kind? (2) Are there reasons to suppose that there are natural kinds? (3) Which, if any, are the natural kinds?

There are three resources Umphrey turns to in order to undertake this inquiry: common sense, scientific theory, and the philosophical tradition (6). Umphrey proceeds under the guide of

common sense in chapters 2–5 of *Natural Kinds and Genesis*, and then under the guide of scientific theory in chapters 6–7. A forthcoming companion volume entitled *The Aristotelian Tradition of Natural Kinds and Its Demise* explores the third resource. The goal of the current book is thus to turn to common sense and scientific theory to discover what it is to be a natural kind and to find reason to believe that such kinds exist. Umphrey claims that his book is “[...] short on doctrine [...] [and] does not, for example, present anything like a complete theory of natural kinds” and he offers instead a “map of the rugged conceptual landscape on which all natural philosophers today must proceed whether they like it or not” (10, cf. 158). Umphrey puts forward this map as “but a draft” offered to guide others “in their own effort to understand natural kinds and to draw a better map” (10). The invitation, clearly genuine, to make such a map both introduces and closes the book and a *map* is a fitting image to pair with the opening taxonomy from Borges. Drawing such a map is the opening step in answering the metaphysical and epistemological angst (with its associated political and ethical perplexity) threatened by the apparent arbitrariness of our classifications of nature. Readers of Umphrey’s book should follow his invitation to further explore natural kinds, but his inquiry into the matter is done with such precision and depth, that the map he has drawn here should serve as a long-standing map for other such investigations.

In drawing the map, Umphrey makes use of three initial hypotheses supported by common sense:

H1. Reality does not depend on how we think or speak about it.

H2. There exists a natural world.

H3. The way we ordinarily think and speak about it has heuristic value. (14)

After giving detailed responses to anti-realist and naturalist objections (14–26), Umphrey goes on to tentatively propose H4: “There are universals, i.e., non-spatiotemporal multiply-exemplifiable entities which are somehow in or beyond the spatiotemporal things which exemplify them” (36). It is important to note that none of H1–H3 is incompatible with H4. In chapter 3, Umphrey thus turns to ask whether natural kinds can be seen as universals, and how such universals relate to the particulars that exemplify them. He argues that several difficulties confront this proposal.

First, supposing some natural-kind types to be genuine universals, is there a second-order universal (namely, natural-kindhood) which they and they alone exemplify? If so, is it yet another natural-kind type? Second, should we be pluralists or holists with respect to natural kinds themselves? Third, if there are non-eidetic as well as eidetic conditions of exemplification, are not tokens of natural kind types likely to be exemplary manifestations of them? (38)

Umphrey does not suggest that we try to answer these questions, and rather moves on to the particulars themselves. But it seems that even if we can conceive of natural kinds as classes and as types, and if we can think of natural kinds as universals, when we turn to particulars we still can not decide whether “such particulars are irreducibly thick or not, and if not, whether they should be regarded as trope clusters (as a thing-ontologist would) or as states of affairs (as a fact-ontologist would). Regarding what seem to be natural kind tokens [...] our inquiry so far has led us into an impasse” (43).

Umphrey responds to this impasse by distinguishing natural kinds and universals and initiating a new inquiry into the nature of “continuants” in chapter 4. We call continuants “entities that remain the same while changing” (49). Umphrey suggests as the exemplary continuant a living thing, and invites us to consider what continuants actually are and whether there are any. What follows is a wonderful narrative of a squirrel who visits Umphrey and his wife in their backyard. Umphrey presents the narrative of this visiting squirrel not only to demonstrate the nature and possibility of continuants, but also to illustrate the nature and difficulties of natural philosophy itself:

[The] natural history of a continuant [includes] what distinguished it from the others, what it had in common with individuals we call [by the same name], and what it had in common with continuants more generally. Naturalists are interested in characteristics of all three sorts. Many, however, are little interested in characteristics of the third sort, whereas a few are very interested in them. The former are naturalists in the narrower, more usual sense of the term: squirrel watchers, bird watchers, ant watchers, as well as hunters, farmers, and the like. The latter are natural philosophers [...] natural philosophers are wondering what it is to

be an individual and whether [the individual living thing] really is the individual he appears to be. (50)

The most pressing difficulty for the natural philosopher is the nature of her object of study: continuants are “essentially beings-in-becoming” (55). That is, for continuants like Umphrey’s backyard squirrel, “variation and invariance, multiplicity and unity, or dependence and independence are both intrinsic to it” (55). Umphrey distinguishes this kind of involvement with the world from other material entities and calls that of the continuant *grade II*, as opposed to *grade I* or *grade III* involvement.

If a natural thing is such that its variation, multiplicity, or dependence on other natural things is extrinsic to the thing itself, then its degree of metabolic, compositional, or situational involvement is *grade I*. If its invariance, unity, or independence from other natural things is extrinsic, then its degree of metabolic, compositional, or situational involvement is *grade III*. And if variation and invariance, multiplicity and unity, or dependence and independence are both intrinsic to it, then its degree of metabolic, compositional, or situational involvement is *grade II*. (55)

The challenge for the natural philosopher is therefore to explain *grade II* involvement without assimilating it to either *grade I* or *grade III* or their sum (56). In an Aristotelian move, Umphrey suggests that the life-activity is the nature of the continuant (64). Such a proposal makes a good deal of sense for *living* things, and it allows him to adopt the hypothesis H5: “there are continuants” (67). Whether such continuants are the objects of scientific study is a question to which Umphrey returns in chapter 7, when he treats of biological kinds.

But having now clarified what continuants are and having given reason to hypothesize that they exist, Umphrey turns in chapter 5 to define a natural kind:

A natural kind, I say, is a class whose members are all and only those continuants that exemplify, in virtue of their essences or natures, a single type. Alternatively, a natural kind is a type whose tokens are all and only those continuants that exemplify

it in virtue of their essences or natures, and that constitute, therefore, a single natural class. (71)

The definition further makes clear what the account of universals in chapter 3 aimed to establish—that natural kinds should be distinguished from universals—and why it is necessary for Umphrey to elucidate the nature of continuants and hypothesize their existence in chapter 4. The essence of the natural kind is derivative upon the essence of its individual members: these continuants are “amphibious beings-in-becoming”; these continuants and the classes that include them seem to be irreducible in our thought, which the definition makes clear. It is in this way that Umphrey answers his first guiding question.

Umphrey must still show that this definition has real application, and thus answer his two remaining questions (Are there reasons to suppose there are natural kinds? What, if any, are the natural kinds?). There are four possible responses to the claim that there are natural kinds: unqualified realism, qualified realism, unqualified anti-realism, and unqualified anti-realism (77–81). All four options have difficulties and all four are compatible with H4 and H5; therefore, Umphrey inclines towards realism for the sake of putting forward the claim that there are natural-kind classes, and maybe natural kind-types, *as a hypothesis*, H6.

H6. There are natural-kind cases, and maybe natural-kind types, in the primary sense of the term. (82)

This is not a hypothesis without its reasons. For starters, common sense strongly favors it and we seem to have some possibly innate abilities to recognize universals in particulars. Also, there seems to be some cross-cultural agreement about which animals belong to which kinds (82). But Umphrey is quick to point out that these claims, even taken together, are not sufficiently compelling to make us accept the hypothesis that there are natural kinds. Most damning of all to these appeals to our common sense or to our innate abilities and shared agreements regarding nature is the observation that our sciences seem to get along perfectly well without natural-kinds concepts: it seems that for the scientist natural kinds concepts may have no theoretical use at all, and that their justification would be purely pragmatic (84). But Umphrey suggests that “then the kinds we take to be natural in everyday life are really pragmatic kinds, Baconian idols which are

helpful if not absolutely indispensable for the perpetuation of *Homo sapiens*, the specific kinship group to which we belong and which we tend naturally to confuse with the specific resemblance class we call ‘human-kind’” (84). It is indeed this seemingly more elevated notion of human-kind that seems to be lurking behind Umphrey’s inquiry, and its existence is most assuredly threatened by the objections to the inquiry he is undertaking. Is the haunting, if humorous, classification of animals presented by Borges so haunting because it makes us fear our ignorance of our own nature, or because it presents the daunting thought that there is no human nature to know? Could it, in fact, be the proper task of the natural philosopher, finally, to give us reason to believe that there are, or are not, proper *human activities* appropriate to the natural kind that is “human kind”? The failure of natural philosophy to achieve this goal would then have significant ethical implications.

Umphrey now finds himself at a juncture. Having defined a natural kind, he can continue down the path of pre-scientific naturalism or turn to scientific inquiry. For the remaining two chapters Umphrey takes the latter approach, turning to the physical and biological sciences in order to seek an answer to his second leading question. His claim is that scientific theory provides an affirmative answer, but the kinds acknowledged by science are not those normally acknowledged by common sense (85). Umphrey himself provides a caveat.

Those interested in metaphysics of natural kinds, but unfamiliar with some of these theories, will find what follows hard going in places. For them I have tried to keep technical matters to a minimum. Those well acquainted with one or another of these theories will find what follows to be rather superficial in places. I ask them to bear in mind my major aim, which is to show how scientific theory does and does not support an affirmative answer to the question whether there are any natural kinds in the primary sense of the term. (92)

Umphrey, if successful in achieving his major aim, would give us reason to accept H6.

Umphrey’s account of scientific inquiry begins with chemistry and asks whether elements and/or their compounds can be natural kinds. In examining the example of H₂O, Umphrey argues that it is a genuine continuant (95). This proposal is not without its difficulties, but some of them appear to be the same difficulties that confront our understanding of the visiting squirrel as a genuine continuant. But what if we look at the atomic constituents of molecules themselves? Could

it be that the periodic table is a “natural kinds realist’s dream come true” (96)? In response to this possibility, Umphrey raises what we can call “potentiality, isotope, and decay problems” (97), all of which make it difficult to suggest that the mutable elements presented on the periodic table are natural kinds according to the definition Umphrey has proposed. It is not clear how to address these problems, and Umphrey leaves them unresolved. The problems thus raise a further question “With respect to the basic tokens of elemental kinds, does chemistry or physics offer the more accurate account of them as they are in their natures?” (97). In response, chemists agree that one must turn to physics.

Umphrey’s discussion of physics moves from particles to fields. It is in this section of the book that I find his earlier caveat to be most applicable. For his argument will perhaps be best understood by those who have spent some significant time studying quantum physics. But in my view, Umphrey still has an unparalleled ability to weave together insights he has gleaned from quantum physics, chemistry, biology, and analytic philosophy with depth, precision, and technical mastery. He concludes his analysis by showing that quantum physics yields to us an unquantified diversity of fermionic fields underlying all matter (103). If such fields are now our candidates for natural kinds, then we do not know how many there are. Other problems follow as well: perhaps most problematically, physicists today are searching for a more comprehensive theory and Umphrey explains well how the potential future advances in physics do not bode well for natural kinds realism—superstring theory reduces kinds to changes in state, multiverse theory makes it unlikely that kinds exist outside our own universe, and structural realism threatens the very disappearance of *things* (104–106).

Structural realism poses a challenge that Umphrey explicitly takes up before finally turning to the study of biological kinds. It is a scientific way of conceiving the world that “takes relations to be prior to objects so related” (106). On the face of it, it seems flatly contradictory to “individual realism,” which puts things prior to relations and seems more consistent with our everyday way of conceiving the world. But there are scientific essentialists (Umphrey focuses on Brian Ellis) who argue that these two views can be combined. The difficulty that emerges from this unstable combination emerges, however, when we juxtapose the Aristotelian tradition of natural kinds with Galilean tradition of natural law:

The Aristotelian tradition of natural kinds focused primarily on human beings, horses, and the like. Such things were thought to be entities (substances), some of them belonging to discrete species in virtue of their inner natures. In this tradition the key metaphor is *eidos*, a term ordinarily associated with seeing (knowing) and what can be seen (the forms of things). Exemplary kinds include *humankind*, *horses*, and *water*, but not *bodies* or *movables*. By contrast, the Galilean tradition of natural law focused primarily on the motions of falling bodies, pendulums, and the like. Such occurrences were thought to exhibit universal patterns in virtue of their inner connectedness. Here the key metaphor is *lex*, a term ordinarily associated with rules governing or regulating behavior in a civil society. (107)

Further, Umphrey defines a law of nature as “an invariant universal relation (connection, nexus) whose relata are quantifiable event-types and whose proper representation is an equation or the like” (108). How then should we compare natural-law realism and natural-kinds realism? Natural-kinds realism depends on the invariance of “enduring things amid qualitative, quantitative, and relational changes. It does not require necessary connections among events,” but natural-law realism “requires necessary connection among events. The invariance to which it looks lies here, in these very connections” (109).

Umphrey suggests that these two outlooks on the world are indeed different, but could be complementary rather than contradictory. But in order to reconcile them, one has to face the burden imposed by the reductionism born out of the Galilean natural law tradition, and defend the possibility of substantive emergence.

From its beginnings in the seventeenth century, natural science has tended to reduce the more phenomenological to the more theoretical, the derivative to the fundamental—which means in effect to reduce the biological to the chemical, the chemical to the physical, the heterogeneous to the homogeneous, the classical world of enduring things and their kinds to the quantum world of fields whose interactions are governed by laws. (111–12)

In the face of this reductionism, we are faced with one of two options: give up individual realism or reconcile individual realism with structural realism by showing that “a theory of everything could not be a theory every *thing*” (112) and to do this, a scientific essentialist has to show that substantive emergence has occurred. Umphrey claims that Brian Ellis, for example, has not done so and turns to provide an outline for a defense of substantive emergence in his final chapter.

Biology might ultimately seem to be the most natural place to look for an inquiry into natural kinds. Our common intuition, as evidenced by Umphrey’s discussion of his visiting squirrel, takes animals and plants as “the foremost natural kinds” (119) and Aristotelians agree, calling species “a class of animals or plants whose members exemplify the same substantive kind in virtue of their intrinsic forms” (119). Darwinians, whose account of species “prevails in biological theory,” disagree. For a Darwinian a species is “a group of living things whose members are all descended from a common ancestor” (120). Umphrey designates the differences between Aristotelian and Darwinian species as typological species (species_t) and genealogical species (species_g). If the latter are the candidate for natural kinds according to evolutionary theory, then they are not like continuants at all and thus fail to meet the definition of natural kinds Umphrey has put forth, “for so caught up are they in evolutionary processes that there appears to be no fact of the matter enabling us to determine when any of them begins or ends” (121). In addition, there is serious disagreement about what constitutes the unity of a species_g among biologists today. It seems that as far as species_g is concerned, anti-realism may be the stronger position (122).

What then about species_t ? Umphrey argues persuasively that geneticists are, in fact, concerned with species_t rather than species_g . This has been true ever since “Mendel posited heritable factors, later called ‘genes,’ which he took to be responsible for the various traits of a living thing or its parts [...] the genes themselves are discrete both as tokens and as types” (123). Biological reductionism thus manifests itself in the tendency to see “macroscopic things as derivative upon their micro-constituents, and to regard things generally as relative to one another in space and time” (129). But although codons may be talked about as the fundamental blocks of reality, the true biologist not only rejects but also accepts the reality of organic individuals because of her combined analytic and holistic bent:

Biological science thus prompts one to reject realism with respect to organisms.

But it also prompts one to accept it. For in no other natural science do *self*-terms

(“self-organization,” “self-regulating”), *auto*-terms (“autocatalyzing,” “autoimmunity”) and *homeo*-terms (“homeostasis,” “homeodynamic”) seem indispensable [...] biological science is of two minds about the reality of organic individuals—its analytic bent inclining it to antirealism, its holistic character inclining it to realism. (130)

Why does this not lead to self-contradiction for the biologist? Umphrey contends that we are safeguarded against such a self-contradiction by distinguishing between the methodological “dividualism” that prevails in biology from the metaphysical “dividualism” that is erroneously believed to be thereby entailed.

Organismal realism takes some if not all living things to be metaphysically individual. Organismal antirealism takes all them to be metaphysically dividual. One cannot accept both. In biology, however, it is *methodological* dividualism that prevails, and will continue to prevail, in evolutionary theory and ecology as well as molecular and developmental biology [...] methodological dividualism does not entail metaphysical dividualism. Therefore, one can be relentlessly analytic in one’s study of living organisms and remain an unwavering organismal realist. (131)

Is this then a missing step that investigators of emergence need in order to explain how substantive emergence could even be possible? For investigators of emergence are “hampered by their inattention to the distinction between substantial and nonsubstantial [emergence], and by their reductionist tendencies more generally” (135). These reductionist tendencies, and this inattention, could both be mitigated by this distinction between metaphysical and methodological dividualism, which could lead to a real recognition that biologists and chemists are taxonomists of natural kinds. Which natural kinds are they exactly? Umphrey offers a summary list of exemplary ones discovered by his investigation into the sciences:

[...] they include the class whose members are all and only hydrogen atoms, provided they are isotopic; the class whose members are all and only H₂O molecules, provided they are essentially isomorphic as well as isomeric; and

perhaps even a class whose members are polyploidal organisms belonging to the species *Galax urceolata*, or beetleweed, provided they resemble one another in virtue of their natures. (136)

Umphrey concedes that these kinds may not be of much interest to chemists or biologists. But if indeed he is right, and I believe he is, then he has established that “notwithstanding some residual difficulties, natural kinds realism appears to be true” (136).

According to two paths of inquiry, one guided by common sense and one guided by scientific investigation, Umphrey’s conclusion gives us reason not to be haunted by Borges’ image of arbitrary classifications with which the book opens. And even though scientific investigation elucidates natural kinds that are not those of common sense, there can be a hint of overlap if one can show how substantive emergence has occurred, which Umphrey’s argument helps to begin make clear. But there is a third resource available for us in order to defend natural kinds realism and that is the philosophical tradition. In fact, it is the philosophical tradition that could pose the most serious threat to any argument for natural kinds realism and could render moot the evidence brought forward by science or common sense. Although Umphrey reserves a fuller discussion of the philosophical tradition for his forthcoming companion volume, he provides an epilogue to his discussion here beginning such an inquiry, but it mostly makes clear *why* such a fuller exploration is needed.

Umphrey points out first, and perhaps surprisingly, that philosophers for the most part have not been natural kinds realists, with the exception of Aristotle (145). For example, Thales himself, who took all things to be water (recall that H₂O molecules, provided they are essentially isomorphic as well as isomeric, turned out to be a natural kind), was “[not] trying to identify the nature of things in terms of token and type or class and class-member [...] [to him] the very idea of a natural kind was irrelevant” (145). One might perhaps think that Plato was a natural-kinds realist, but consider the following:

Yet Platonic forms (*eidê*) are not natural-kind types, since the things partaking of them are not beings-in-becoming; and although the different groups (*gene*) into which these quasi-continuants fall may seem to us to be natural-kind classes, they

are not well defined apart from the classificatory activities (divisions and collections) of someone's mind. (146)

One might wonder why there have been so few, if any, natural kinds realists (or for that matter, natural philosophers) after Aristotle. Part of the reason is that there have been, according to Umphrey, four crises for natural philosophy in its history, all of which were potentially devastating to the enterprise and all of which have prompted a different response. The four prime movers of these crises were "Parmenides, Socrates, medieval Schoolmen, and Kant" (154–155). For Parmenides, "nature is incoherent inasmuch as it rests on a refusal to distinguish strictly between being and nonbeing" (155). Socrates, according to Plato's *Phaedo*, makes a turn from "sensory experience and becoming to arguments based on hypotheses about what things *are*" (155). On the account given in this dialogue, for Socrates the proper subject of this study is the human being itself, for the sake of which one studies nature. Natural philosophy is secondary to political philosophy. The Hellenistic philosophers responded to this challenge with wide disagreement, but none became natural kinds realists. The medieval Schoolmen "subordinated natural philosophy primarily to the authority of Church doctrine, and secondarily to the authority of Aristotelian physics" (156). Natural philosophy was no longer guided by its own lights, but became the twin handmaidens of revelation according to the Church and the inherited Aristotelian science. In the seventeenth century, this twin handmaidenship came to be severed as Aristotelian physics was rejected. This paved the way for the fourth major crisis, Kant's claim that world is empirically real but transcendently ideal. Such a claim can "secure the foundations of Newtonian physics against Hume's skeptical attack [...] and find room for moral freedom in a deterministic world. But if nature is transcendently ideal, if its very reality depends on the *a priori* structure of the human mind, then all earlier physicists, and many since have been fundamentally mistaken [...] the investigation of nature (empirical reality) is the job of scientists alone [...] There is no longer any place for natural *philosophy*" (157). Kant's distinction now shows up in what Umphrey earlier calls in chapter 2 "protometaphysical antirealism" and "philosophical naturalism".

How *should* one carry forward with natural philosophy in the face of such crises? It is not so clear, and a deeper investigation of the causes and effects of these crises as well as the contrasting Aristotelian tradition of natural kinds awaits Umphrey's fuller inquiry in his forthcoming companion volume. Umphrey is also rightly agnostic about the future twists and turns that natural

philosophy may potentially take (158). But it is even clearer now why we need a clear map of where we have gone and where we are, to see which paths lead to various pitfalls, traps, and dead ends. Looked at in this way, Umphrey's map is an exemplar for all who wish to travel in search of natural kinds.

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